

ANTIMONY

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More than one-half of the primary antimony used in the United States during 2004 went into flame-retardants; most of the remainder was used by the ceramic, chemical, glass, and transportation industries. Secondary antimony, which was derived almost entirely from recycled lead-acid batteries, was used in the manufacture of new batteries. In 2004, the average price of antimony was 20% higher than that of 2003.

There was no domestic antimony mine production during the year. Most primary antimony metal and oxide were produced domestically from imported raw material. Most domestic smelting consisted of upgrading imported antimony trioxide to a higher purity. Primary antimony metal and oxide were produced by two companies operating two plants—one in Montana and one in Texas. Secondary antimony was recovered in lead alloy from scrapped lead-acid batteries at secondary lead smelters. The amount of antimony used by battery manufacturers was substantially lower than it was 10 years earlier because of changing materials requirements for batteries. Industry stocks declined sharply owing to the closure of one of the two domestic smelters (table 1).

Antimony was mined as a principal product or was a byproduct of the smelting of base-metal ores in 11 countries. World mine production rose slightly. Nearly all the world's primary antimony was mined in China (88%), South Africa (5%), Bolivia (3%), and Tajikistan (2%) (table 9).

Production

Mine Production.—There was no domestic mine production in 2004. The Nation's last domestic byproduct antimony producer, Sunshine Mining Co. (Idaho), closed its mine in early 2001.

Smelter.—The domestic producers of primary antimony metal and oxide products were Laurel Industries Inc., LaPorte, TX, and U.S. Antimony Corp., Thompson Falls, MT.

Great Lakes Chemical Corp. (Indianapolis, IN) and Laurel Industries Inc. [a subsidiary of Occidental Chemical Corp. ("OxyChem")], which is wholly owned by Occidental Petroleum Corp., merged their antimony businesses to form a joint venture to develop, produce, and market raw materials for antimony-based flame-retardants, synergists, and catalysts. Great Lakes and OxyChem both hold a 50% stake in the new company, which operates under the name GLCC Laurel, LLC. The integration of business units included the antimony oxide and synergists manufacturing assets, intellectual property, and customer lists for both Great Lakes and Laurel. Great Lakes became the managing partner with the responsibility for credit, customer service, logistics, sales, and technical support. Great Lakes officials noted that the domestic antimony industry continued to face pressure from Chinese imports and that by merging operations with Laurel, the unified operation would increase its competitive position. Manufacturing for the joint venture will be consolidated into the existing Great Lakes antimony production facility in Reynosa, Mexico. The Laurel production facility in La Porte, TX, which employed 14 people, ceased production by yearend 2004; production of raw materials for flame-retardants and catalyst grades of antimony oxide was transferred to the Great Lakes facility in Mexico (Great Lakes Chemical Corp., 2004).

At yearend 2004, the United States had only one antimony smelter, the United States Antimony Corp. (USAC), based in Montana. USAC produced antimony metal for bearings, lead alloys, and ordnance; antimony oxide as a raw material for flame-retardants; and sodium antimony for glass, etc. USAC also recycled many antimony products which otherwise would be taken to landfill sites (Metal-Pages, 2004c§).

Consumption

In 2004, reported consumption of primary antimony (table 2) rose about 21% from that of 2003. Most categories of consumption registered moderate increases compared with those of 2003 (table 3). Industry sources attributed the increase to cyclical factors such as increased demand in the world's automobile industry and certain sectors of the flame-retardant field.

Lead-antimony alloys were used in ammunition, antifriction bearings, automotive vehicle batteries, cable sheaths, corrosion-resistant pumps and pipes, roof sheet solder, and tank lining. Antimony trioxide, often dissolved in an organic solvent, was used to enhance the flame-retardant properties of rubber and textiles as well as plastics and other combustibles. Antimony was also used as a decolorizing and refining agent in some forms of glass, such as optical glass.

Of the 137 companies to which a U.S. Geological Survey (USGS) antimony consumption survey was sent, 78 firms responded. Consumption data were estimated for the remaining 59 firms. Net imports of antimony, however, indicate that U.S. consumption is considerably higher than that estimated and reported from the USGS consumption survey.

¹References that include a section mark (§) are found in the Internet References Cited section.

Prices

Antimony prices rose moderately during the course of 2004. The antimony price averaged \$1.22 per pound in January and reached a peak of \$1.35 per pound for April. The price drifted downward at midyear, reaching an average price of \$1.14 per pound in July. The price strengthened in the second half of the year, finishing the year with an average monthly price of \$1.34 in December. The average antimony price for the year increased 20% compared with that of 2003. The price increase was attributed to increased world demand, while world supply remained steady.

Traders and users noted an increasing amount of high-bismuth content antimony, which many consumers find unusable, appearing from China. Industry sources believed this situation may have had two causes—the Chinese started mining “complex ores” that may contain higher percentages of bismuth, and the Chinese were importing antimony ores and concentrates from new sources. Concern over the high-bismuth antimony prompted Metal Bulletin to adjust its specification to reflect a benchmark quality. As of October 1, 2004, the Metal Bulletin price quotation applied to antimony having a maximum bismuth content of 100 parts per million (Metal Bulletin, 2004a).

Trade

U.S. imports of antimony were, as is usually the case, much larger than exports—about tenfold larger in 2004 (tables 5-8). Imports of antimony increased by 25% from the levels of 2003, with the categories of antimony ore and concentrate and metal registering the greatest relative gains. China remained the largest provider of all three categories—antimony metal, antimony oxide, and ore and concentrate.

World Review

Australia.—Republic Gold Limited announced that a significant antimony deposit had been found at its Northcote Project in Queensland, Australia. The firm reported finding resources grading 2.5% antimony sulfate (Republic Gold Ltd., 2004).

China.—The Chinese Ministry of Commerce published the official list of state-owned antimony producers and approved exporters for 2005. There were 10 state-owned antimony producers listed, including China Minmetals Corp., Guangdong Metals and Minerals I&E Group Corporation, Guangxi Huasheng Metal and Minerals Trading Corp., Guizhou Metals and Minerals I&E Corps., and Hsikwangshan Twinkling Star Antimony Corp. Among the 20 approved exporters were Guangxi China Antimony Chemical Corp., Guizhou Dongfeng Enterprise Group Corp., Hunan Province Huachang Antimony Industrial Co., LTD, and Liuzhou China Tin Group (Metal-Pages, 2004b\$).

In southwest China, the local government of the Guangxi Autonomous Region announced that it had granted state-owned China Minmetals Group the right to develop the Nandan antimony mines, which were the largest in China. The Guangxi Region local government, however, would retain some interest in the mines. Minmetals was finalizing plans to undertake a mining feasibility study at the mine area, which may take a year to complete. Reportedly, more than 300 shafts were operated illegally in the area in the past. Before mining could resume, the company would have to first find a way to drain the mines, which have been flooded since 2001. The Nandan mines were the largest producer of antimony in China before they were shut down, with production of about 50,000 metric tons per year (t/yr) of contained antimony. The mines produced a relatively high-grade concentrate compared with that of other Chinese producers. Several years of preparation would still be needed before the mines could be restarted (Metal Bulletin, 2004b).

Anhua Kuixi Antimony Industry Co., Ltd. (Hunan Province, China), an antimony smelter that was producing 2,400 t/yr of antimony trioxide, announced plans to build a new plant to produce antimony ingot. Anhua officials stated that competition was so strong among antimony trioxide smelters that profit margins were slim. Officials anticipated better profits from the upstream production antimony ingot, most of which would be used for its own antimony trioxide output (Metal-Pages, 2004d\$).

Albemarle Corp. (Richmond, VA), a flame-retardant producer, announced that it had formed a strategic alliance with China Antimony Chemicals (a subsidiary of China Minmetals Nonferrous Metals) to market antimony trioxide in the United States. Albemarle planned to sell antimony trioxide produced at the Minmetals plant in Nanning, Guangxi Autonomous Region (Ryan's Notes, 2004).

Kyrgyzstan.—In September, bidding opened for a 70% stake in the world's former leading antimony producer, the Kadamzhay Antimony Combine of Kyrgyzstan, with three relatively unknown Russian firms the only bidders for the idled plant. All three reportedly studied the Combine's documentation in 2003 and previously had supplied it with raw materials. The Government originally set the starting price at \$2 million, but the State Property Committee indicated it would be willing to pass it on to an investor free of charge, provided the latter undertakes an obligation to revive the facility. The plant was commissioned in 1936 with a capacity of 20,000 t/yr. It produced just 1,300 metric tons (t) in 2003 and 1,500 t in 2002. It finished 2003 with debts of \$850,000. Kadamzhay had hoped to boost 2004 output to 3,600 t, but the plant stood idle most of the year, producing just 318 t of antimony and alloys. The plant reportedly could not get enough raw materials because its traditional suppliers, Russia and Tajikistan, have redirected their shipments to China, while Kyrgyzstan's own ore base is largely depleted. Traditionally, Russia takes most of Kyrgyz antimony, and the rest is sold to Europe (Metal-Pages, 2004a\$).

Outlook

The use of antimony as an ingredient in flame-retardants is expected to remain its principal consumption category. This is expected to be true for international as well as U.S. markets.

Antimony recovered from old scrap has been an important part of the total antimony supply, but its decline as a significant source in the last quarter century will continue. Following the advent in the 1970s of low-maintenance and maintenance-free automotive batteries, the antimony content of a typical car lead-acid battery today has fallen to about 0.6%. Thus, modern lead-acid batteries have either low levels of or no antimony. Industry sources believe the antimony level in lead-acid batteries will reach zero by 2020.

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GENERAL SOURCES OF INFORMATION

U.S. Geological Survey Publications

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Other

- Antimony, Ch. in Mineral Facts and Problems, U.S. Bureau of Mines Bulletin 675, 1985.

TABLE 1
SALIENT ANTIMONY STATISTICS¹

(Metric tons of antimony content unless otherwise specified)

	2000	2001	2002	2003	2004
United States:					
Production:					
Primary:					
Mine, recoverable antimony	W	--	--	-- ^e	--
Smelter	13,300	9,080	W	W	W
Secondary	7,700	5,380	5,350	5,600	6,310
Exports of metal, alloys, waste and scrap (gross weight)	1,080	1,730	992	771	566
Exports of antimony oxide ²	6,040	5,880	3,260	2,910	3,240
Imports for consumption	41,600	37,900	28,500	26,700	33,500
Reported industrial consumption, primary antimony	16,400	13,100	11,500	9,230	11,200
Stocks, primary antimony, all classes, December 31	6,780	4,990	5,060	6,320 ^r	2,790
Price, average, cents per pound ³	65.5	64.7	88.4	107.5	130.3
World, mine production	126,000	157,000	113,000	112,000 ^r	113,000 ^e

^eEstimated. ^rRevised. W Withheld to avoid disclosing company proprietary data. -- Zero.

¹Data are rounded to no more than three significant digits, except prices.

²Antimony content is calculated by the U.S. Geological Survey.

³New York dealer price for 99.5% to 99.6% metal, cost, insurance, freight U.S. ports.

TABLE 2
 REPORTED INDUSTRIAL CONSUMPTION OF
 PRIMARY ANTIMONY IN THE UNITED STATES¹

(Metric tons of antimony content)

Year	Class of material consumed			Total
	Metal	Oxide	Other ²	
2003	1,590	7,620	26	9,230
2004	1,740	9,390	84	11,200

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes residues and sulfide.

TABLE 3
REPORTED INDUSTRIAL CONSUMPTION OF PRIMARY ANTIMONY IN THE
UNITED STATES, BY PRODUCT¹

(Metric tons of antimony content)

Product	2003	2004
Metal products:		
Antimonial lead	910	1,200
Bearing metal and bearings	43	36
Solder	85	85
Other ²	1,370	1,680
Total	2,410	3,010
Nonmetal products:		
Ammunition primers	W	W
Ceramics and glass	487	524
Pigments	597	535
Plastics	532	W
Other ³	488	1,410
Total	2,100	2,470
Flame-retardants:		
Adhesives	W	676
Plastics	3,680	4,690
Rubber	126	119
Textiles	150	189
Other ⁴	767	63
Total	4,720	5,740
Grand total	9,230	11,200

W Withheld to avoid disclosing company proprietary data.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes ammunition, cable covering, castings, sheet and pipe, and type metal.

³Includes fireworks and rubber products.

⁴Includes paper and pigments.

NOTE: Secondary antimonial lead production was 5,600 metric tons (t) in 2003 and an estimated 5,600 t in 2004.

TABLE 4
INDUSTRY STOCKS OF PRIMARY ANTIMONY IN
THE UNITED STATES, DECEMBER 31¹

(Metric tons of antimony content)

Type of material	2003	2004
Metal	578 ^r	463
Oxide	3,540 ^r	2,310
Other ²	2,200	16
Total	6,320 ^r	2,790

^rRevised.

¹Data are rounded to no more than three significant digits
may not add to totals shown.

²Includes ore and concentrate, residues, and sulfide.

TABLE 5
U.S. EXPORTS OF ANTIMONY METAL, ALLOYS, AND WASTE AND SCRAP,
BY COUNTRY¹

Country	2003		2004	
	Gross weight (metric tons)	Value (thousands)	Gross weight (metric tons)	Value (thousands)
Canada	305	\$885	370	\$1,180
Costa Rica	8	25	3	11
El Salvador	10	28	22	66
Mexico	407	1,240	97	365
Netherlands	1	90	41	143
Sweden	23	141	9	144
Switzerland	5	70	2	27
Other	13 ^r	533 ^r	24	345
Total	771	3,010	566	2,280

^rRevised.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

Source: U.S. Census Bureau.

TABLE 6
U.S. EXPORTS OF ANTIMONY OXIDE, BY COUNTRY¹

Country	2003			2004		
	Gross weight (metric tons)	Antimony content ² (metric tons)	Value (thousands)	Gross weight (metric tons)	Antimony content ² (metric tons)	Value (thousands)
Argentina	126	105	\$501	153	127	\$635
Australia	45	37	153	15	12	45
Belgium	137	114	503	115	95	656
Brazil	61	51	235	67	56	237
Canada	1,450	1,200	3,760	1,520	1,260	4,400
Chile	21	17	25	12	10	41
China	67	56	255	49	41	136
Colombia	29	24	94	65	54	208
France	33	27	105	96	80	755
Germany	78	65	487	49	41	180
Japan	49	41	262	282	234	926
Korea, Republic of	41	34	158	211	175	690
Mexico	662	549	2,000	738	613	2,060
New Zealand	29	24	84	32	27	138
Pakistan	60	50	333	20	17	111
Saudi Arabia	53	44	135	--	--	--
Singapore	20	17	152	14	12	95
South Africa	54	45	249	41	34	110
Spain	24	20	132	--	--	--
Taiwan	14	12	37	26	22	186
Thailand	48	40	119	78	65	230
Turkey	129	107	755	63	52	278
United Kingdom	206	171	861	174	144	749
Other	69 ^r	56 ^r	246 ^r	79	64	306
Total	3,500	2,910	11,600	3,910	3,240	13,200

^rRevised. -- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Antimony content is calculated by the U.S. Geological Survey.

Source: U.S. Census Bureau.

TABLE 7
U.S. IMPORTS FOR CONSUMPTION OF ANTIMONY, BY CLASS AND COUNTRY¹

Country	2003			2004		
	Gross weight (metric tons)	Antimony content ² (metric tons)	Value (thousands)	Gross weight (metric tons)	Antimony content ² (metric tons)	Value (thousands)
Antimony ore and concentrate:						
Austria	36	34	\$148	--	--	--
Canada	1	1	4	--	--	--
China	352	350	747	1,450	1,380	\$3,860
Japan	--	--	--	(3)	(3)	4
Mexico	39	28	109	--	--	--
Russia	--	--	--	195	194	542
Saudi Arabia	--	--	--	100	100	295
Vietnam	--	--	--	80	80	202
Total	428	412	1,010	1,820	1,750	4,900
Antimony oxide:						
Belgium	2,590	2,150	5,910	2,110	1,750	4,670
Brazil	3	2	19	19	16	38
China	9,560	7,940	22,800	12,900	10,700	30,700
France	21	18	36	1	1	8
Germany	36	30	358	10	8	141
Hong Kong	1,720	1,430	4,150	520	432	1,370
India	10	8	32	--	--	--
Japan	162	134	580	171	142	765
Kyrgystan	--	--	--	126	105	266
Liechtenstein	--	--	--	(3)	(3)	4
Mexico	8,720	7,240	15,100	11,600	9,590	28,500
South Africa	3,170	2,630	5,440	790	656	628
Switzerland	(3)	(3)	3	38	32	114
Taiwan	--	--	--	3	2	9
United Kingdom	--	--	--	(3)	(3)	6
Vietnam	--	--	--	20	17	49
Total	26,000	21,600	54,400	28,300	23,500	67,200

-- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Antimony ore and concentrate content reported by the U.S. Census Bureau. Antimony oxide content is calculated by the U.S. Geological Survey.

³Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 8
U.S. IMPORTS FOR CONSUMPTION OF ANTIMONY METAL, BY COUNTRY¹

Country	2003		2004	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Belgium	--	--	168	\$386
Bolivia	14	\$12	--	--
Canada	66	530	100	826
Chile	--	--	20	45
China	3,350	8,300	5,820	14,700
France	11	20	11	29
Germany	5	50	(2)	104
Hong Kong	21	50	--	--
Japan	1	92	1	60
Mexico	655	441	785	707
Netherlands	3	7	19	47
Peru	394	938	501	875
Russia	99	251	105	258
South Africa	--	--	649	756
Taiwan	--	--	20	56
Thailand	14	29	--	--
United Kingdom	--	--	46	102
Vietnam	38	88	20	53
Other	-- ^r	-- ^r	12	5
Total	4,670	10,800	8,270	19,100

^rRevised. -- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 9
ANTIMONY: WORLD MINE PRODUCTION, BY COUNTRY^{1,2}

(Metric tons)

Country	2000	2001	2002	2003	2004 ^e
Australia ³	1,511	1,380	1,200 ^e	1,300 ^e	1,800 ⁴
Bolivia	1,907	2,264	2,336	2,911 ^r	3,000
Canada ⁵	433	234	143	88 ^r	90
China ^e	110,000	140,000	100,000	100,000 ^r	100,000
Kyrgyzstan ^e	150	150	150	40	20
Mexico ⁶	39	--	--	-- ^e	--
Peru, refined	461	274	356	356 ^e	356
Russia, recoverable ^e	4,500	4,500	NA ⁷	NA	NA
South Africa ⁵	4,104	4,927	5,746	5,310 ^e	5,300
Tajikistan ^e	2,000	2,500	3,000	1,800	2,000
Thailand, content of ore and concentrate	84	18 ^r	1 ^r	38 ^r	40
Turkey ^e	360	330 ^r	250 ^r	650 ^r	500
United States	W	--	--	-- ^e	--
Total	126,000	157,000	113,000	112,000 ^r	113,000

^eEstimated. ^rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data; not included in "Total."

-- Zero.

¹World totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

²Antimony content of ore unless otherwise indicated. Table includes data available through May 27, 2005.

³Antimony content of antimony ore and concentrate, lead concentrates, and lead-zinc concentrates.

⁴Reported figure.

⁵Antimony content of concentrate.

⁶Previously published data for Mexico included antimony mined in other countries and smelted in Mexico. That prior data were, in metric tons, as follows: 2000—52; 2001—81; 2002—155; 2003—434 (revised); 2004—595.

⁷Reports indicate that Russian antimony production was sharply curtailed.